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Treatment of Problem Behavior Multiply Maintained By Access to Tangible Items and Escape from Demands

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TREATMENT OF PROBLEM BEHAVIOR MULTIPLY MAINTAINED BY ACCESS TO TANGIBLE ITEMS AND ESCAPE FROM DEMANDS

by

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ABSTRACT

TREATMENT OF PROBLEM BEHAVIOR MULTIPLY MAINTAINED BY ACCESS TO TANGIBLE ITEMS AND ESCAPE FROM DEMANDS
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Functional analysis is a behavioral assessment that identifies sources of operant reinforcement that maintain problem behavior. These assessments may identify single reinforcers (e.g., positive reinforcement in the form of attention) or multiple reinforcers (e.g., positive reinforcement in the form of attention and negative reinforcement in the form of escape from instructions) for the same behavior. In such cases, analysts will design interventions for each identified "function" but the sequencing of these interventions may impact their success at treating problem behavior. The current study evaluated the sequential treatment of problem behavior for a child whose functional analysis identified sensitivity to multiple reinforcers, similar to those described above. We first targeted problem behavior maintained by positive reinforcement in the form of access to tangible items using functional communication training (FCT). We subsequently targeted problem behavior maintained by negative reinforcement in the form of termination of instruction using Differential Reinforcement of Compliance (DRC). The implications for this intervention sequence are discussed.
Keywords: differential reinforcement, multiple control, problem behavior

TABLE OF CONTENTS

LIST OF FIGURES

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Beginning in the late 1970's, it became clear that the occurrence of severe problem behavior, such as self-injury, could best be understood as operant behavior (Carr, 1977). That is, these dangerous behaviors are repeated because of their impact on the acting individuals internal or external environment as opposed to biological or psychodynamic psychological processes. Further, Carr posed that these severe behaviors do not have a universal etiology. Severe problem behavior tends to evoke social responses including attention from caregivers or the removal of a recently presented demand as well as sensory consequences produced by the behavior (e.g., pain presentation, pain attenuation) and that any of these consequences in isolation or in conjunction may serve as operant reinforcement. Thus, an understanding of the occurrence of problem behavior requires an understanding of the unique learning history presented by each individual.

Iwata et al. (1982/1994) presented the first comprehensive assessment model to identify the unique reinforcers contributing to problem behavior on an individual basis. This assessment involved arranging a series of reinforcement tests in which a potential environmental reinforcer was established (i.e., withheld) and delivered contingent upon each instance of problem behavior. Iwata et al. included tests for social disapproval, termination of demands, and sensory stimulation and compared the occurrence of problem behavior during each test session to a control condition in which the participant had free access to attention, no demands, and a variety of stimulating materials. Reliably elevated levels of problem behavior in a test condition relative to a control condition indicated sensitivity to that particular form or reinforcement, whereas non-elevated levels of problem behavior in a test condition indicated insensitivity to that particular form of reinforcement. Across nine participants, this model of functional analysis identified a single and unique source of reinforcement for the problem behavior of eight of nine participants.

The value of conducting a functional analysis and identifying the sensitivity of problem behavior to an environmental reinforcer lies in the improved ability of a behavior analyst to then accurately predict and implement efficacious behavioral treatments. To the extent that the reinforcers identified by a functional analysis are accurate reflections of operant reinforcement maintaining problem behavior, then analysts should be able to predict effective interventions (e.g., disrupting and withholding interaction following problem behavior reinforced by caregiver attention should result in operant extinction) from ineffective interventions (e.g., disrupting and withholding interaction following problem behavior reinforced by the termination of academic demands should create negative reinforcement). Iwata et al. (1994) examined the predictive utility of functional analysis with three individuals presenting with topographically identical (head hitting) but functionally distinct (maintained by automatic, social positive, and social negative reinforcement) self-injury, as indicated by a functional analysis. These experimenters then systemically applied extinction-based interventions that were predicted to be either efficacious or non-efficacious based upon the results of the functional analysis. In each case, the assessment accurately predicted both those interventions that would be effective and those that would be ineffective.

The process of conducting a functional analysis has been replicated in several hundred studies (Hanley, Iwata, & McCord, 2003; Beavers & Iwata, 2011) and has become the standard for practice in the assessment and treatment of severe problem behavior. Further, the large-scale conduct of these assessments has allowed a greater understanding of the epidemiology (i.e., causes and distribution) of severe problem behavior (Iwata, Vollmer, & Zarcone, 1990; Kahng, Iwata, & Lewin, 2002a, 2002b). For instance, Iwata et al. (1994) reported the outcomes from 152 functional analyses conducted in an inpatient hospital and identified that 26.3% of cases demonstrated sensitivity to social positive reinforcement, 38.1% of cases demonstrated sensitivity to social negative reinforcement, and 25.7% demonstrated sensitivity to automatic reinforcement. This study also reported that 90.1% of these assessments identified a single source of reinforcement for problem behavior. An additional 5.3 percent of cases (8 of 152) identified sensitivity to more than one source of reinforcement (four cases of attention and escape, two cases of attention and sensory stimulation, and two cases of escape and sensory stimulation). More recently, Beavers and Iwata (2011) evaluated published functional analysis research and identified that 16.9% of functional analyses have indicated sensitivity to multiple sources of reinforcement.

The typical intervention model in the case of a single reinforcer is to disrupt the reinforcement contingency for problem behavior, ideally through operant extinction, and to program that same event as reinforcement for some other more appropriate behavior. For instance, in the case of problem behavior maintained by the termination of academic demands, differential reinforcement of compliance is a common intervention (Lalli et al., 1999; Piazza, Moes, & Fisher, 1996; Payne & Dozier, 2013) that involves withholding breaks following problem behavior and instead providing breaks contingent upon instructional compliance. However, treating problem behavior maintained by multiple sources of reinforcement creates a unique challenge for practitioners. For example, in a case when problem behavior is reinforced both by escape from demands and access to tangible items, the onset of instructional procedures would necessitate the disruption of access to toys. Thus, while one source of reinforcement is being addressed through differential reinforcement of compliance, the relevant establishing event (toy removal) remains present and may continue to evoke problem behavior during the treatment process. One solution to this problem is to sequence interventions that would allow the behavior analyst to abolish the value of one source of reinforcement while developing behavioral interventions to address the other source of reinforcement.

Although it is clearly problematic that a behavior analyst would arrange two establishing events when disrupting toy play to present instructions, it is possible to abolish the value of instruction termination by not presenting demands during sessions in which the contingency between problem behavior and access to tangible items is disrupted. That is, a behavior analyst can withhold tangible items and differentially reinforce an alternative response without presenting academic demands and thus address one source of reinforcement for problem behavior in isolation. Functional Communication Training (FCT; Hagopian, Boelter, & Jarmolowicz, 2011; Tiger, Hanley, and Bruzak, 2008) is a well-established intervention technique for addressing such positive reinforcement contingencies. FCT involves withholding reinforcement for problem behavior and teaching an alternative functional communication response (FCR) that will result in the same positive reinforcer (Carr & Durand, 1985).

Presumably, after the relationship between problem behavior and access to the positive reinforcer (e.g., tangible items) has been disrupted by FCT the behavior analyst can introduce task demands without evoking tangibly maintained problem behavior. In fact, the tangible reinforcer could be delivered along with breaks during differential reinforcement of compliance (Lalli et al., 1999) such that appropriate responding results in access to two functional reinforcers (breaks and tangible items). Thus, treatment success may be improved by introducing behavioral interventions thoughtfully and sequentially rather than arbitrarily.

The sequence of first addressing problem behavior maintained by positive reinforcement and then addressing problem behavior maintained by negative reinforcement has been presented elsewhere. Smith, Iwata, Vollmer, and Zarcone (1993) addressed the multiply maintained problem behavior of a woman with Down Syndrome whose self-injury was maintained by automatic reinforcement and negative reinforcement (i.e., breaks from demands). These experimenters first addressed automatically maintained self-injury by delivering noncontingent access to toys and subsequently addressed negatively reinforced self-injury using demand fading with escape extinction (i.e., reducing the number of demands during a session, providing physical guidance to complete instructions, and then gradually increasing the number of demands). This sequence of interventions resulted in rapid reductions of problem behavior in both contexts, but it is not clear what effects these interventions had in establishing compliance as these data were not presented.

Day, Horner, and O'Neill (1994) also adopted the sequence of treating sources of positive reinforcement followed by negative reinforcement with three individuals with intellectual disabilities and multiply maintained problem behavior. The authors first implemented FCT for sources of positive reinforcement (food and drinks) and then implemented FCT for sources of negative reinforcement (breaks). This intervention model successfully reduced problem behavior and increased appropriate communication in each case, but we note that instructional compliance was never addressed as part of their intervention. That is, participants learned to requests breaks through more socially appropriate means, but by study's end were not required to complete any instruction. The absence of problem behavior in such cases is clearly preferable to non-intervention, but we suspect parents, teachers, and other caregivers would not be satisfied with interventions that permitted their wards to regularly avoid academics and personal-hygiene activities.

Neidert, Iwata, and Dozier (2005) similarly implemented FCT sequentially across sources of positive and negative reinforcement with two children with autism spectrum disorders displaying problem behavior maintained by attention and demand termination. Interestingly, in this study, the authors varied the sequence of training across participants with one participant experiencing FCT for escape prior to FCT for attention and one participant experiencing FCT for attention prior to FCT for escape. Problem behavior was immediately reduced to low levels of both participants. It is also worth noting that unlike tangible items, for which engagement must be disrupted prior to completing most academic demands, attention may be continually available during instruction (i.e., instruction delivery is a social interaction). Thus, sequencing of sources of positive and negative reinforcement may be less important when the source of positive reinforcement is attention than when the source of positive reinforcement is tangible items.

By contrast however, Lalli and Casey (1996) attempted to arrange DRC with access to instructional breaks with a young boy with developmental delays who engaged in aggression maintained both by attention and escape from demands. Problem behavior persisted during this treatment but reduced after the authors included social interaction during the reinforcer period. Thus, it appeared that the absence of social interaction did evoke problem behavior during instructional periods, both confounding the results of their treatment evaluation and compromising the efficacy of behavioral intervention.

Our current study evaluated treatment of problem behavior with a 7-year old girl who engaged in aggressive and destructive behavior. A functional analysis indicated her problem behavior was maintained by both access to tangible items and escape from demands. Based upon previous research, we first implemented FCT to address problem behavior maintained by access to tangible items. We then arranged access to breaks and tangible items as a reinforcer for compliance using DRC procedures to address problem behavior maintained by negative reinforcement. The results of this child's treatment as well as the implications of the sequence of treatment components are discussed.

Method

Participant and Setting

Jade, a seven-year-old girl diagnosed with autism spectrum disorder and moderate intellectual disability participated in this evaluation. She was referred for the assessment and treatment of problem behavior and attended school in a special education classroom with similarly aged peers. She communicated vocally through short two to three-word phrases with occasional full sentences. Her fine motor skills were delayed, but she was capable of copying letters with a pencil.

We conducted all sessions in Jade's bedroom at her family's home. Her room included a bed, a dresser and chest of drawers, a small table and set of chairs, a television, and a variety of children's toys. Across all phases of this evaluation, sessions were 10 min in duration and were conducted as part of Jade's assessment and treatment process. Approximately 10 to 15 sessions were run each day.

Measurement and interobserver agreement

A data collector scored the occurrence of each instance problem behavior (including self-biting, hitting, kicking, pushing, pulling, biting, pinching, and throwing, kicking, and hitting objects), functional communication responses (FCR; saying "Toy, please"), independent task completion (writing a letter or word within 5 s of an instruction), and prompted task completion (writing a letter or word within 5 s of a model prompt).

A second observer simultaneously, but independently scored these same behaviors during 10% of sessions during the functional analysis, 24% of sessions during tangible treatment, and

43% of sessions during escape treatment to provide estimates of interobserver agreement (IOA). We compared observer's records using the proportional agreement method, which involved dividing each session into consecutive 10-s intervals and comparing observers records on an interval-by-interval basis. We provided a score of one to each interval recorded identically and a proportional agreement scored to each interval recorded non-identically calculated by dividing the smaller number of recorded responses by the larger number of recorded responses. We then divided the sum of all scores by the total number of intervals and converted this quotient into a percentage. This process yielded mean the following IOA scores, for the functional analysis problem behavior was 95.6% (range, 82% to 100%). During the tangible treatment components problem behavior IOA was 98.1% (range, 84% to 100%) and FCR was 98.5% (range, 92% to 100%). During the escape treatment components problem behavior IOA was 99% (range, 80% to 100%) and compliance was 95.6% (range, 87% to 100%).

Preference Assessment Procedures

The therapist administered the Reinforcer Assessment for Individuals with Severe Disabilities (RAISD) with Jade's mother to identify preferred toys, food, and social interactions**.** We then systematically evaluated Jade's preference for these nominated items in a paired-item preference assessment (Fisher et al., 1992). In this assessment model, two items were presented in front of Jade and she was asked to "pick one." An approach to one of the items resulted in 30 s access while the other was removed. Each item was presented once in a pair with every other item and these items were then rank-ordered based on the percentage of presentations in which they were selected. This assessment was used to identify preferred toys for inclusion in the functional analysis and later to inform differential reinforcement procedures. This assessment identified a tablet computer as the most highly preferred item.

Functional Analysis Procedures

We conducted a functional analysis of problem behavior including tests for individual reinforcement contingencies (Iwata et al., 1982/1994). Based upon parental nomination during our intake interview, we included tests for sensitivity to attention (mild reprimands), tangibles (tablet access), escape (from academic demands), and automatic reinforcement (sensory stimulation or removal). Each of these test conditions involved attempts to establish the value of the reinforcer (i.e., withholding the reinforcer) and delivering that reinforcer contingent upon problem behavior.

Prior to each *Attention* test session, the therapist would interact with Jade for 1 min, and would then begin sessions by stating, "I need to work" and turning away from Jade. Following each instance of problem behavior, the therapist provided a brief reprimand such as, "Stop! That hurts" and then withdrew her attention again. Prior to each *Tangible* test session, the therapist would provide access to the table for 1 min and began sessions by removing the tablet from Jade's possession. Following each instance of problem behavior, the therapist returned the tablet for 30 s. To initiate each *Escape* test session, the therapist presented an academic (fine motor) demand (writing a letter on a dry erase board with a marker) and waited 5 s. If Jade did not complete the task within 5 s, the therapist repeated the instruction while providing a model of the response (writing the letter on a whiteboard after stating, "Write A, like this") and waited an additional 5 s. If Jade did not complete the task, the therapist then physically guided task completion and then presented the next instruction. Following an instance of problem behavior, the therapist removed the dry erase board while stating, "Okay, you don't have to." After 30 s, the therapist would re-issue the demand. To initiate *Automatic Reinforcement* test sessions, the therapist withheld attention, did not provide any instructions, removed access to the tablet and did not respond to any instance of problem behavior. Each of these test conditions was alternated in a fixed-sequence (Hammond, Iwata, Fritz, & Bloom, 2013) multielement design along with a control condition. During the *control* sessions, the therapist delivered attention and tablet access continuously and avoided presenting any demands, such that each tested reinforcer was available noncontingently during these sessions.

We depict the results of Jade's functional analysis in Figure 1. This assessment indicated high levels of problem behavior during tangible (open squares) and escape sessions (closed triangles) with comparatively low levels in the attention (closed squares), ignore (closed circles), and control (open circles) sessions. These results suggested that Jade's problem behavior was sensitive to tangible items as positive reinforcement and escape from instruction as negative reinforcement.

Treatment Evaluation (Tangible Context) Procedures

Baseline. Following the functional analysis, we established a baseline rate of problem behavior. These sessions were identical to the tangible condition in the functional analysis in that the therapist disrupted tablet access and returned the tablet for 30 s following an instance of problem behavior. Following this baseline, we implemented FCT.

Functional Communication Training (FCT). These sessions were similar to baseline except that problem behavior no longer resulted in the tablet (i.e., extinction) and instead the therapist delivered the tablet following the occurrence of the vocal, functional communication response (FCR) "Toy please." This response was selected in consultation with Jade's mother. The therapist taught the FCR by providing a vocal model of this response for Jade to then imitate. FCT began by presenting a model of the response immediately following tablet removal (i.e., a 0-s delay). If Jade echoed this response, the therapist delivered the tablet for 30-s. If she did not echo this response, the therapist repeated the vocal prompt every 5 s.

We compared baseline and FCT conditions in a reversal design. During the second implementation of FCT, the therapist began delaying her model prompt by 5 s after removal of the tablet to promote independent FCRs.

Treatment Evaluation (Tangible Context) Results and Discussion

Jade engaged in high levels of problem behavior during baseline (*M* = 3.7 per min; Figure 2), which reduced to low levels during FCT (*M* = .8 per min). Problem behavior increased during a reversal to baseline (*M* = 2.3 per min) and returned to low levels with the resumption of FCT conditions (*M* = .6 per min). At the conclusion of this treatment evaluation, we evaluated delay tolerance procedures (data not shown) in which we successfully delayed the delivery of reinforcement for each FCR by 10 min in which we provided access to a variety of alternative leisure items during the delay.

These results show that FCT was an efficacious treatment for problem behavior maintained by access to tangible items, even when this child had not yet received treatment for problem behavior maintained by escape from demands. Part of the success of this intervention stemmed from the ability to establish access to tangible items as a reinforcer, by disrupting access to the tangible item, while simultaneously abolishing the value of escape from instruction as a reinforcer, by withholding instructions during these sessions. Thus, we were able to segregate the impact of two sources of reinforcement for the same topography of problem behavior and allow therapists to address one source of reinforcement at a time.

Had we attempted to address sources of negative reinforcement initially, baseline sessions would have involved simultaneously (a) disrupting ongoing play and (b) presenting academic demands. It is likely that disrupting ongoing play would have continued to evoke problem behavior within that context and thus potentially confound that evaluation. However, following treatment, play disruption ceased to evoke problem behavior. Thus, we should be positioned for a cleaner treatment evaluation related to negative reinforcement contingencies.

Treatment Evaluation (Escape Context) Procedures

Baseline. We established a baseline of problem behavior within an instructional context using procedures identical to those of the escape condition in the functional analysis. That is, a therapist presented academic instruction using three-step prompting and problem behavior resulted in task termination for 30 s.

Differential reinforcement of compliance (DRC). These sessions were similar to baseline in that the therapist provided instructions using three-step prompting except that problem behavior no longer resulted in task termination (i.e., extinction). Instead, compliance with the instruction resulted in a 30-s break with access to her tablet. Therefore, compliance resulted in both positive and negative reinforcement. Initially, both prompted and independent responding resulted in access to these breaks.

We compared baseline and DRC conditions in a reversal design. During the second phase of DRC we provided reinforcement only following independent task completions to increase independence. We then progressively increased the number of tasks required (1, 2, 3, 4, 6, 9, 12, 15, 19, and 26 letters) to earn a break following every three sessions with less than 10% of baseline rates of problem behavior. After meeting criterion for writing 26 consecutive letters, we then increased the task difficulty to writing 2 letter words and increased the work requirement to earn reinforcement periods from 1 to 15 words. As the number of tasks completed increased, we maintained the initial ratio of 30 s of reinforcement per task completed (what Roane, Falcomata, & Fisher, 2007 referred to as unit price).

Treatment Evaluation (Escape Context) Results and Discussion

Jade engaged in high levels of problem behavior during baseline (*M* = .9 per min; Figure 3), which reduced to low levels following some variability during DRC on an FR-1 schedule (*M* = .9 per min). Problem behavior increased during a reversal to baseline (*M* = 1.1 per min) and returned to low levels with the resumption of the DRC FR-1 condition (*M* = .4 per min). Following the reversal problem behavior remained relatively low throughout with some variability as the schedule of reinforcement increased and task chaining was added. At the conclusion of this treatment evaluation, we assessed the maintenance of an FR-15 schedule in which Jade independently complied with writing 15 consecutive words for 7.5 minutes of reinforcement.

These results show that DRC was an efficacious treatment for problem behavior maintained by access to escape from demands. Notably, the disruption of toy play during DRC sessions did not evoke problem behavior, lending credence to the presumption that first reducing tangibly maintained problem behavior would reduce the likelihood of evoking this behavior concomitant with instruction delivery. If DRC would have been implemented prior to FCT, it seems likely problem behavior would have persisted longer.

In addition, this sequence of intervention allowed us to capitalize on the use of the positive reinforcer (i.e., the tangible item) to support compliance. Lalli et al. (1999) demonstrated that delivering positive reinforcement (even without breaks) for compliance can be a more effective intervention in some cases than delivering breaks without positive reinforcement. The combination of both contingencies likely enhances the efficacy of DRC interventions supporting both reductions in problem behavior and supporting compliance. Further, the incorporation of positive reinforcement into instructional contexts may minimize the motivation for escape (e.g., what Horner, Day, & Day, 1997 referred to as a neutralizing routine) and, pertinent to individuals with multiply controlled problem behavior, prevents the establishing operation for tangible items from building and evoking problem behavior during longer instructional periods in which appropriate requests are less likely to be honored.

General Discussion

The prevalence of multiply controlled problem behavior is low relative to the frequency of single reinforcement sources from summaries of both clinical outcomes and in the published literature (Iwata et al., 1994; Beavers & Iwata, 2011). Although less frequent, clients presenting with these multiply controlled problem behaviors may be more difficult to treat due to the need to isolate and disrupt each source of reinforcement. The current study evaluated a sequence of addressing social positive reinforcement initially followed by social negative reinforcement, which resulted in efficacious intervention for our participant.

This study serves to replicate and expand the literature pertaining to multiply controlled problem behavior. Despite more than 34 years of functional analysis and treatment research, the published evidence for treatment of multiply maintained problem behavior is, in our opinion, surprisingly limited, and the specific reinforcers included in "multiple" control is diverse across studies (e.g., automatic reinforcement and attention, attention and tangible items, attention and escape, tangibles and escape) and have incorporated multiple intervention types across each reinforcer (e.g., noncontingent reinforcement, FCT, and DRO). Thus, the combination of (a) addressing problem behavior maintained both by tangibles and escape by (b) implementing FCT and DRC is unique to the research literature.

We credit the success of our intervention in part to the sequencing of FCT and DRC interventions. However, we did not specifically evaluate the utility of this sequence, nor has anyone else previously to our knowledge. Our intervention sequence seems logical, but it is possible that one could implement treatment for either reinforcer successfully regardless of sequence. This remains and area for future research.

One may also reasonably question the value of addressing the reinforcers maintaining problem behavior in sequential isolation. Recent research has suggested synthesizing reinforcement contingencies, similar to how we delivered both positive and negative reinforcement during DRC, as the first stage of treatment (Hanley, Jin, Vaneslow, & Hanratty, 2014). This approach stems from the assumption that in the normative environment, children who engage in problem behavior are not escaping demands in isolation but are typically escaping to environments in which they have access to positive reinforcers (e.g., leaving a work area to a play area in a classroom). Therefore, ecologically valid interventions would treat both consequences as a single (interacting) functional reinforcer by combining them during intervention (i.e., an intervention to reduce escaping to tangible items). Assuming the reinforcers for problem function independently for some (possibly most individuals given the prevalence of single relative to multiple function outcomes reported by Iwata et al., 1994), this synthesized approach should be effective in reducing problem during instructional contexts. That this, this approach presents the relevant establishing operations for both tangibles and demand removal simultaneously and teaches a single "omnibus" request to access both reinforcers such that reinforcement delivery abolishes both reinforcers abating further problem behavior within this context. However, access to tangible items can also be potentiated outside of instructional contexts in most normative environments (i.e., individuals will seek access to toys outside of instruction) and thus teaching an additional appropriate request for tangible reinforcement via FCT will still be necessary. It is not clear if there would be a substantive difference in treatment efficacy or efficiency by addressing maintaining reinforcers simultaneously and then individually as suggested by Hanley et al. or individually but sequentially as we have described here. Additional comparative research will be necessary to answer this question.

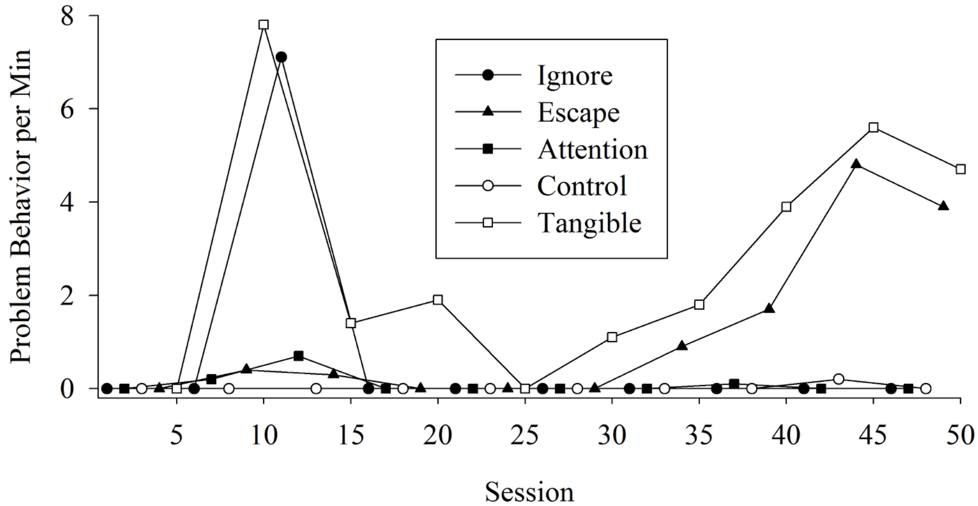

Figure 1. Results of Jade's functional analysis indicating problem behavior maintained by access to tangible items and escape from demands

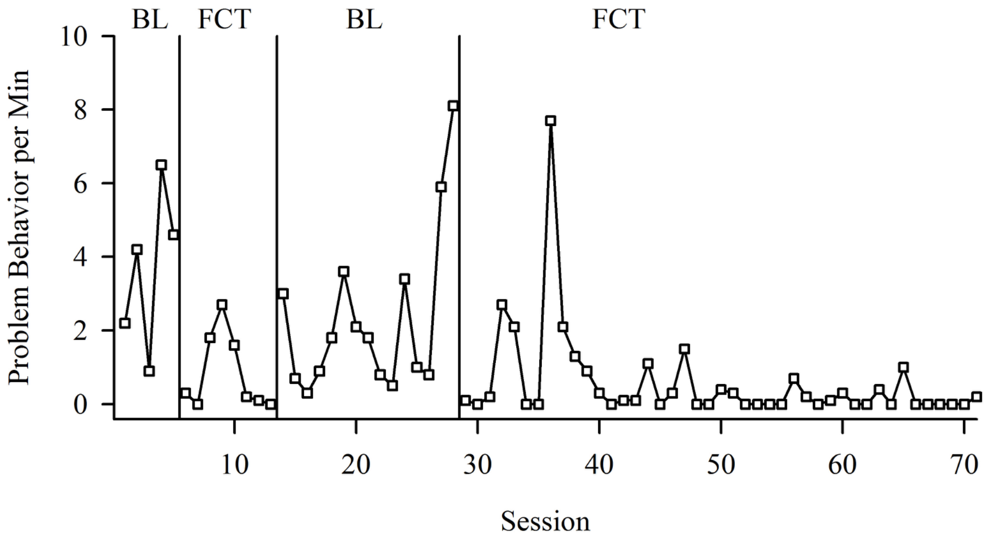

Figure 2. Treatment outcomes for problem behavior during the tangible treatment

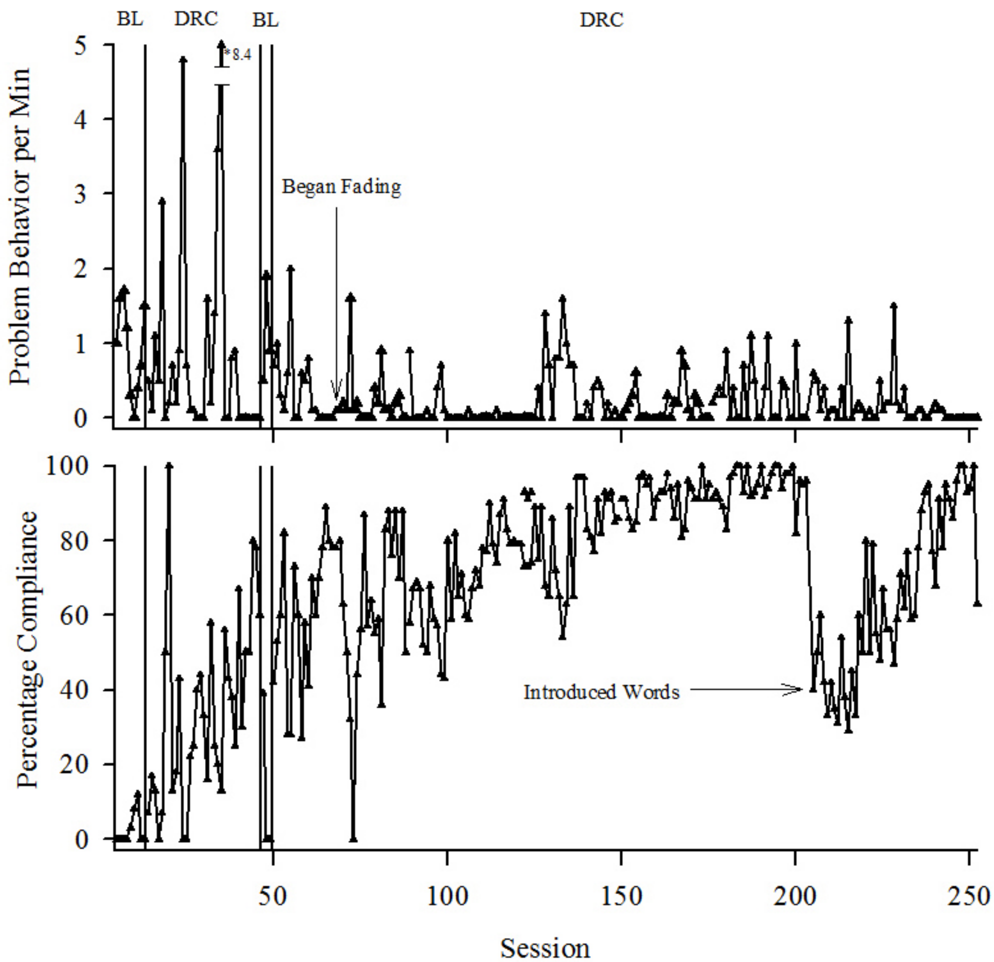

Figure 3. Treatment outcomes for problem behavior and compliance during escape treatment.

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